MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

PTG 0116 – TRIGONOMETRY AND COORDINATE GEOMETRY

(All sections / Groups)

17 NOVEMBER 2015
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FIVE** printed pages (including cover page) with **FOUR** questions and an appendix only.

2. Answer **ALL** questions.

3. Write your answers in the Answer Booklet.

Question 1

(a) Verify the identity $\dfrac{\sin 2\theta + 2\sin^2\theta}{\cos 2\theta}$. [6 marks]

(b) Solve the trigonometric equation $7\cot^2 x - 5 = 0$ for $0 \le x \le 360$. [8 marks]

(c) Solve the triangle in Figure 1 below. Then, find the area of the triangle using the Heron's formula. Leave your answer to 2 decimal places.

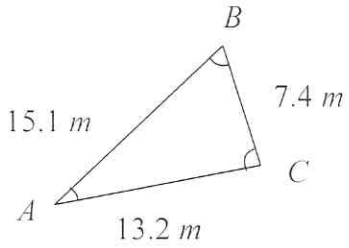

Figure 1

[11 marks]

Question 2

(a) Given $\mathbf{u} = 2\mathbf{i} + \mathbf{j} + 3\mathbf{k}$, $\mathbf{v} = 2\mathbf{i} - \mathbf{j}$ and $\mathbf{w} = -\mathbf{i} - 4\mathbf{j} + 7\mathbf{k}$. Find:

i. $|\mathbf{u} \times \mathbf{w}|$. [6 marks]

ii. $\mathbf{u} \cdot (2\mathbf{v} + \mathbf{w})$. [3 marks]

iii. $|\mathbf{u} \times \mathbf{w}|[\mathbf{u} \cdot (2\mathbf{v} + \mathbf{w})]$. [2 marks]

Continued...

(b) Given two complex numbers $z = 2 + 3i$ and $w = -5 + 3i$.

i. Find $\frac{z}{w}$. Find your answer in $a + bi$ form. [4 marks]

ii. Find $z^5 w$ using De Moivre's theorem. Express your answer in $a + bi$ form. [10 marks]

Question 3

(a) Given the equation of a hyperbola is $16x^2 - 9y^2 - 96x - 18y - 9 = 0$, find the:

i. center. [5 marks]

ii. vertices. [3 marks]

iii. foci. [4 marks]

iv. asymptotes of the hyperbola. [4 marks]

v. equation of straight line AB that is perpendicular to transverse axis of the hyperbola and passes through the center. [4 marks]

Then, sketch the hyperbola $16x^2 - 9y^2 - 96x - 18y - 9 = 0$. [5 marks]

Continued...

Question 4

(a) Given that $P = \begin{bmatrix} 2 & 5 & 0 \\ 1 & -1 & 0 \\ 3 & -2 & -4 \end{bmatrix}$ and $Q = \begin{bmatrix} 1 & -1 & 4 \\ 0 & 3 & 5 \\ 0 & 0 & 7 \end{bmatrix}$. Evaluate:

i. $|P^2|$ [4 marks]

ii. $P^T - Q^T$ [5 marks]

(b) Solve the following system of linear equations by using the inverse of the coefficient matrix

$$x + y - z = 2$$
$$x + 2y + 2z = 3$$
$$y + z = 5$$

[16 marks]

End of Paper

APPENDIX
Trigonometric identities and formulas

$\cos^2 A + \sin^2 A = 1$ $\quad \sec^2 A = 1 + \tan^2 A$ $\quad \csc^2 A = 1 + \cot^2 A$

$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\quad \cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \cos^2 A - \sin^2 A$

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ $\quad ...$ $\quad \sin 2A = 2\sin A \cos A$

$\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ $\quad ....$ $\quad \tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

$2\sin A \cos B = \sin(A + B) + \sin(A - B)$

$2\cos A \cos B = \cos(A + B) + \cos(A - B)$

$2\sin A \sin B = \cos(A - B) - \cos(A + B)$

$\sin A + \sin B = 2\sin\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$ $\quad ....$ $\quad \sin A - \sin B = 2\cos\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\cos A + \cos B = 2\cos\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$ $\quad$ $\cos A - \cos B = -2\sin\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\sin^2\dfrac{A}{2} = \dfrac{1-\cos A}{2}$ $\quad$ $\cos^2\dfrac{A}{2} = \dfrac{1+\cos A}{2}$ $\quad$ $\tan^2\dfrac{A}{2} = \dfrac{1-\cos A}{1+\cos A}$

$\sin\dfrac{A}{2} = \pm\sqrt{\dfrac{1-\cos A}{2}}$ $\quad$ $\cos\dfrac{A}{2} = \pm\sqrt{\dfrac{1+\cos A}{2}}$ $\quad$ $\tan\dfrac{A}{2} = \pm\sqrt{\dfrac{1-\cos A}{1+\cos A}} = \dfrac{1-\cos A}{\sin A} = \dfrac{\sin A}{1+\cos A}$